SHORT RESUME/ SYNOPSIS OF Ph.D. TOPIC

Entitled

"INFLUENCE OF MEDICINALPLANT EXTRACT-ENRICHED DIET ON GROWTH PERFORMANCE AND BIOMETRICS ON *Cyprinus carpio* (Linnaeus, 1758)."

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"INFLUENCEOF MEDICINAL PLANT EXTRACT-ENRICHED DIET ON GROWTH PERFORMANCE AND BIOMETRICS ON *Cyprinus carpio*(Linnaeus, 1758)."

1. A BRIEF RESUME OF PROPOSED WORK / PROBLEM:

The rapid growth of the aquaculture sector has underscored the need for sustainable and efficient methods to enhance fish productivity. One of the primary challenges in aquaculture is improving the growth performance and health of cultured fish species while minimizing reliance on synthetic additives like antibiotics and chemical growth promoters. These additives, although effective, pose significant concerns related to environmental pollution, fish health, and human food safety due to chemical residues.

Cyprinus carpio (common carp), a globally important aquaculture species, requires optimal nutritional strategies to ensure high productivity under captive conditions. Medicinal plants, with their rich bioactive compounds, have emerged as a natural and eco-friendly alternative to synthetic additives. Plants like tulsi (*Ocimum sanctum*), neem (*Azadiracta indica*), turmeric (*Curcuma longa*), ashwagandha (*Withania somnifera*), and fenugreek (*Trigonella foenum-graecum*) are known for their antioxidant, immune stimulatory, antimicrobial, and growth-enhancing properties. These plants contain compounds such as flavonoids, alkaloids, saponins, curcuminoids, and phenolics, which have shown promise in promoting fish health and growth.

The proposed study seeks to evaluate the effects of incorporating these medicinal plant extracts into the diet of *Cyprinus carpio* under controlled captive conditions. It will focus on assessing key growth performance indicators such as weight gain, specific growth rate (SGR), feed conversion ratio (FCR), and survival rates. Biometric parameters like condition factor, length-weight relationship, and hepatosomatic index will also be analyzed to determine the fish's overall physical condition and health status.

Additionally, the study will explore the health benefits conferred by the plant extracts, including enhanced immunity, stress tolerance, and reduced oxidative stress. The antioxidant activity of the extracts may help mitigate the adverse effects of environmental stressors commonly encountered in aquaculture systems. By boosting immunity, these natural additives can also reduce the incidence of diseases, lowering the need for

antibiotic treatments. The proposed research focuses on developing a medicinal plant extract-enriched diet to enhance the growth performance, biometrics, and health of *Cyprinuscarpio.* In regard to this, the current study has been set up to examineCommon Carp fish in substantial detail, including:

- Evaluation of water quality of Habitat.
- Taxonomy of Cyprinuscarpio.
- Morpho-regulatory morphometric effects of *Cyprinus carpio*
- Growth pattern analysis of *Cyprinus carpio.*
- Hematology, SGR, FCR and CF in *Cyprinus carpio.*

2. INTRODUCTION TO PROPOSED RESEARCH TOPIC:

Aquaculture is a rapidly growing sector that plays a critical role in meeting the global demand for high-quality protein. However, the sustainability of aquaculture practices is challenged by issues such as disease outbreaks, suboptimal growth, and environmental impact. The use of synthetic growth promoters and antibiotics, while effective in enhancing fish productivity, has raised significant concerns about environmental pollution, the development of antibiotic-resistant pathogens, and chemical residues in aquaculture products. These challenges underscore the need for natural, sustainable alternatives to promote fish growth and health.

Medicinal plants have garnered increasing attention as potential feed additives in aquaculture. Rich in bioactive compounds such as flavonoids, alkaloids, phenolics, and saponins, medicinal plants are known for their growth-promoting, immuno-stimulatory, antioxidant, and antimicrobial properties. Plants such as tulsi (*Ocimum sanctum*), neem (*Azadirachta indica*), turmeric (*Curcuma longa*), ashwagandha (*Withania somnifera*), and fenugreek (*Trigonella foenum-graecum*) have been widely used in traditional medicine for their therapeutic benefits and are now being explored for their applications in fish nutrition. *Cyprinus carpio* (common carp) is one of the most widely cultured freshwater fish species due to its adaptability, high growth rate, and market demand. Enhancing its growth performance and health under captive conditions is essential for maximizing productivity. Incorporating medicinal plant extracts into the diet of *Cyprinuscarpio* offers a promising approach to achieving these goals. These plant-based diets are expected to improve growth metrics such as weight gain, specific growth rate (SGR), and feed conversion ratio (FCR) while also boosting immunity, stress tolerance, and overall health.

The proposed research focuses on evaluating the effects of a diet enriched with tulsi, neem, turmeric, ashwagandha, and fenugreek extracts on the growth performance and biometric parameters of *Cyprinus carpio*. This study will provide insights into the potential of medicinal plant extracts as natural alternatives to synthetic growth promoters, addressing the growing need for sustainable aquaculture practices.

The findings will contribute to the development of eco-friendly and cost-effective feeding strategies, enhancing fish productivity while reducing environmental impact and ensuring the production of safe, high-quality aquaculture products. This research aligns with the global shift toward sustainable aquaculture, benefiting both producers and consumers.

3. SURVEY OR REVIEW OF LITERATURE AND DEVELOPMENT IN THE RELEVANT SUBJECT:

Medicinal plants have bioactive compounds (e.g., flavonoids, alkaloids, tannins) known to enhance growth, immunity, and overall health in fish.

Pandey, G., and Madhuri, S. (2014) focused on medicinal plants as an alternative source of protein and immunity booster in fish diets.

Sahu et.al., (2012) studies reveal that tulsi, containing eugenol and other essential oils, enhances nutrient assimilation and improves the specific growth rate (SGR) and feed conversion ratio (FCR) in various fish species, including carps .Tulsi extracts also promote stress resistance under suboptimal conditions.

Neem leaves are rich in bioactive compounds such as Azadirachtin, nimbin, and flavonoids. Dietary inclusion of neem has been linked to improved weight gain and growth indices in fish due to its ability to stimulate digestive enzymes and enhance nutrient absorption (Ghosh et.al., 2019).

Known for its adaptogenic properties, ashwagandha extract boosts the innate immune system by enhancing macrophage and lymphocyte activity. Studies on carps showed that dietary ashwagandha reduces cortisol levels under stress and improves survival rates (Pandey et al., 2017).

Ahmadifar, E. et.al., (2021) studies on applications of herbal extracts in aquaculture: A review on fish immune responses and health.

Explore research on growth parameters (weight gain, feed conversion ratio (FCR), specific growth rate (SGR)) influenced by plant-based dietary supplements.

Basavaraju, Y. et.al., (2008). Effects of dietary supplementation with plant extracts on growth and feed utilization in Cyprinuscarpio.

Harikrishnan, R., and Balasundaram, C. (2005) studies on fish growth promotion by herbal extracts.

4.OBJECTIVES OF THE RESEARCH AND PROPOSED HYPOTHESIS:

The Objectives of study are to:

- To collect the medicinal plant from study area.
- To prepare and synthesize medicinal plant extract using Tulsi, Neem, Turmeric, Ashwandha and Fenugreek.
- Collection of Common carp fish *Cyprinus carpio* from study area.
- Evaluate the water quality of the Habitat.
- Study the Morpho regulatory and morphometric analysis of *Cyprinus carpio*.
- To determine growth, colouration factor, length in *Cyprinus carpio*.
- To evaluate changes in length-weight relationship, condition factor, and morphometric indices in response to plant extract diets.
- To assess the impact of Medicinal plant extract diets on weight gain, specific growth rate, and feed conversion ratio and condition factor in *Cyprinus carpio*.

5. METHODOLOGY TO BE USED AND ADOPTED:

The study involves evaluating the influence of a medicinal plant extract-enriched diet on the growth performance and biometrics of *Cyprinus carpio* under controlled captive conditions.Medicinal plants known for their growth-promoting and immunomodulatory properties will be selected. The extracts will be prepared using standard solvent extraction methods (e.g., ethanol or methanol extraction) and quantified for bioactive compounds using high-performance liquid chromatography (HPLC).

Healthy *Cyprinus carpio* specimens of uniform size and weight will be randomly divided into control and experimental groups, with triplicates for each group. Experimental diets will be formulated by enriching commercial fish feed with varying concentrations of the plant extract (e.g., 1%, 2%, and 3% inclusion levels). The control group will receive unmodified

commercial feed.Fish will be fed twice daily at 3% of body weight for 60 days. Water quality parameters (temperature, pH, dissolved oxygen, and ammonia levels) will be monitored and maintained.

Parameters such as weight gain, specific growth rate (SGR), feed conversion ratio (FCR), and condition factor (CF) will be measured. Morphometric indices will also be recorded.

Data will be analyzed using ANOVA to determine the significance of the diet on growth performance and biometrics.

6. IMPORTANCE OF STUDY:

International Status :- The common carp *(Cyprinus carpio)* is one of the most studied and extensively cultured fish species globally due to its adaptability, rapid growth, and economic importance. Research on *Cyprinus carpio* spans multiple domains, including aquaculture, genetics, nutrition, physiology, and ecology. Below is a summary of the international status of studies involving this species.

National Status :- In India, *Cyprinus carpio* (common carp) holds a vital position in freshwater aquaculture due to its adaptability, rapid growth, and compatibility with Indian aquaculture systems. Introduced to India in the early 20th century, it has become an integral species in polyculture systems alongside Indian major carps such as rohu (*Labeorohita*), catla (*Catlacatla*), and mrigal (*Cirrhinus mrigala*). Below is an overview of the status of *Cyprinus carpio* research and aquaculture practices in India.

Regional Status :- Latur district, located in the Marathwada region of Maharashtra, has significant potential for freshwater aquaculture due to its abundant water bodies, including farm ponds, reservoirs, and minor irrigation tanks. Despite being traditionally known for agriculture, aquaculture practices in the district have gained attention in recent years. Studies on *Cyprinus carpio*(common carp) in this region reflect the growing interest in integrating fish farming with existing agricultural systems. Below is an overview of the status of *Cyprinus carpio* studies and aquaculture in Latur.

Scope/Significance of study :- This study evaluates the effects of a medicinal plant extract-enriched diet, including tulsi, neem, turmeric, ashwagandha, and fenugreek, on the growth performance and biometrics of *Cyprinus carpio* under captive conditions. It focuses on key parameters such as weight gain, feed efficiency, and biometric indices like condition factor

and hepatosomatic index, alongside health benefits like enhanced immunity and stress tolerance.

The research is significant for advancing sustainable aquaculture by offering eco-friendly alternatives to synthetic additives. The findings will support organic fish farming, ensuring improved productivity, environmental sustainability, and safe, high-quality aquaculture products for consumers.

7. PROPOSED WORK PLAN WITH A TENTATIVE CHAPTER SCHEME:

The work plan of the proposed study can be summarized into following chapters respectively

1. Introduction.
2. Review of Literature.
3. Material and Methods.
4. Synthesis of medicinal plant extract.
5. Specimen collection from study area and analysis of physic-chemical parameters during study period.
6. Morpho regulatory and Morphometric effects of medicinal plant on *Cyprinos carpio.*
7. Analysis of hematology, SGR, FCR, CF will be measured.
8. Result and discussion.
9. Summery and Conclusion.
10. Bibliography.

8. PROPOSED WORK PLAN/ FORMULATION AND STRUCTURE OF STUDY:

First Year-

- Survey and Review of literature.
- Prepare a detail methodology for experimental trials.
- Collection of medicinal plant from study area.

Second Year-

- Selection and preparation of medicinal plant extract.
- Specimen collection.
- Analysis of physio-chemical parameters.

Third year-

- Morpho regulatory and morphometric analysis of *Cyprinuscarpio.*
- Evaluate hematological, SGR, FCR and CF on *Cyprinuscarpio*
- Collection of statistical data and submission of thesis.

9. EXPECTED OUTCOME:

The proposed study is expected to demonstrate the positive influence of medicinal plant extract-enriched diets on the growth performance and biometric parameters of *Cyprinus carpio*. Fish fed with diets supplemented with tulsi, neem, turmeric, ashwagandha, and fenugreek extracts are anticipated to show improved growth metrics, including higher weight gain, better specific growth rate (SGR), and lower feed conversion ratio (FCR) compared to control groups.

The antioxidant and immuno-stimulatory properties of the plant extracts may reduce oxidative stress, improve immune responses, and increase survival rates, particularly under stressful captive conditions.Furthermore, the study is likely to establish these medicinal plant extracts as effective, eco-friendly alternatives to synthetic growth promoters, aligning with sustainable aquaculture practices. The findings could provide valuable insights into the potential of plant-based diets to enhance fish health, growth, and productivity while minimizing the environmental and health risks associated with chemical additives. This research will contribute to the development of natural, cost-effective strategies for improving aquaculture performance, supporting sustainable fish farming practices worldwide.

The direction of this research work can be adjusted depending upon the findings from time to time, to attain the best expected result within the schedule.

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